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ABSTRACT

Four recently developed computer programs can help students with the composition process. The first, a prewriting program, helps students prepare to write by asking them a series of questions, similar to those an instructor would ask, intended to help them think more deeply about their subject. The second writing program also contains prewriting questions, but attempts to show subsequently how information gathered during the questioning can be structured during the actual writing stage by creating a model rough draft of the essay. The third program, developed as a text editing system for journalism assignments, relies on a matching routine that takes a series of predetermined key words and searches for them in the student's news story. The program acknowledges pertinent information and points out errors with an explanation when the pertinent information is missing. In the fourth program, also a text editing program, the computer "reads" the entered essays, then prints out statistics on sentence length, use of prepositions, and use of "to be" verbs and nouns ending in "tion." The statistics are followed by an appropriate warning about convoluted sentences or the excess of the "tion" nouns or "to be" verbs. These programs do not actually understand the essay, and better programs will be developed as more people contribute to the task; but they do successfully take students through their assigned phases in the writing process, freeing the instructor for more individualized instruction. (HTH)

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PREWRITING, WRITING, AND EDITING BY COMPUTER

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Efforts to create a computer program that understands normal human language (as opposed to a specialized computer language) have been underway since the early 1950's when the Pentagon invested millions of dollars on attempts to find a program that would automatically translate Russian scientific journals into English. Many years and millions of dollars later, the attempt was abandoned when it became clear that human language was simply too complex to be handled by available computers.

Now, thirty years and several generations of computers later, the situation is still essentially unchanged. Despite amazing advances in computer technology, and despite several promising new approaches such as the one by Roger Schank at Yale University,[1] there is not now, nor is there likely soon to be, a computer program that can understand English.

Given this problem it would seem that the English class would be the last place one could find computers to be of value. And in general this has been the case. There are a few drill and practice programs that may run elementary or remedial secondary students through spelling or grammar drills, but there hasn't been anything that could help students with the real issue of English class - the learning of writing.

1. Roger Schank and Robert Abelson. Scripts, Plans, Goals and Understanding, Hillsdale, N.J.: Lawrence Erlbaum Associates, 1977.

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That is until now. Now within the last two or three years four separate attempts have been made to use computers to help students learn writing itself. Each of the four takes a completely unique approach to the problem, and each of the four is restricted by the fact that the computer never fully understands what students are saying to it, but each is also partially successful in giving students instant, and individualized, instruction in some phase of the writing process. Taken together, the four programs are able to help a student prewrite, write, and edit a composition - all by computer.

The computer program that helps students through the prewriting stage of writing was created by Professor Hugh Burns of the U.S. Air Force Academy. This program helps students prepare to write by asking them a series of questions based on Aristotle's enthymene tapoi, Burke's pentad, and the Young-Becker-Pike tagmemic matrix. Typically students about to write an essay sit down individually at a computer after class, type in what they think their essay subject might be, and then are led through thirty to sixty minutes of questioning intended to help them think more deeply about their subject.

To illustrate, Burns quotes part of one session a student, Karen, has with the computer prior to writing an essay on Dreiser's dramatic technique.

COMPUTER: QUESTION 1

DESCRIBE HOW DREISER'S DRAMATIC TECHNIQUE PHYSICALLY CHANGES.

KAREN: PLEASE EXPLAIN

COMPUTER: IM LOOKING FOR YOUR NOTIONS ABOUT THE DEVELOPMENT OF DREISER'S DRAMATIC TECHNIQUE....

FOR EXAMPLE, IF I WERE WRITING ABOUT ANOTHER SUBJECT,

SAY HUMAN DEVELOPMENT, I WOULD WRITE ABOUT GROWTH, THE CHANGES THAT ARE DUE TO MATURING. YOU KNOW ADULT "PASSAGES" HAVE BEEN POPULAR FARE LATELY.

COMPUTER: YOUR TURN KAREN.

KAREN: I WANT TO SHOW HOW SISTER CARRIE ALLOWED DREISER TO GROW, TO CONFRONT COMMON VALUES. IT IS A MATURE WORK.

COMPUTER: GOOD, KAREN. ADD TO YOUR RESPONSE NOW.

KAREN: HURSTWOOD GROWS THE OTHER WAY. THERE ARE NEGATIVE PASSAGES, AREN'T THERE?

COMPUTER: YES, THAT SEEMS OKAY TO ME.

KAREN: ME TOO.

COMPUTER: AH, SHORT AND SWEET. PLEASE ELABORATE A LITTLE.

KAREN: WELL, CHARACTERS EITHER GET WORSE OR BETTER: THEY EITHER PASS TO A BETTER UNDERSTANDING OR NOT.

COMPUTER: TERRIFIC, KAREN!

KAREN: SOMETIMES HIS DETAILS GET IN THE WAY OF HIS ORGANIZATION AND HIS EFFECTIVENESS--BUT CONTINUE!

COMPUTER: OKAY.

(ALL IDEAS ARE GOOD IDEAS: TYPE IN WHAT YOU THINK!!!!)

QUESTION 2 - ONE OF MY FAVORITES - COMING UP:

TAKE A MENTAL PHOTOGRAPH OF DREISER'S DRAMATIC TECHNIQUE. DESCRIBE ONE IMPORTANT DETAIL.

KAREN: I DON'T UNDERSTAND WHAT YOU WANT ME TO SAY.

COMPUTER: CONCENTRATE NOW ON SEEING DREISER'S DRAMATIC TECHNIQUE. WHAT FEATURE STANDS OUT THE MOST? DESCRIBE. YOUR TURN KAREN.

KAREN: LIKE THE SETTINGS?

COMPUTER: YES, THAT SEEMS OKAY.

KAREN: THE FACTORY VS. THE HOTEL.

COMPUTER: THAT'S THE IDEA, KAREN. GIVE ME SOME MORE INFORMATION.

KAREN: I SEE HURSTWOOD AS A SCAB. THOUGH HE'S BEEN REDUCED, HE STILL HAS SOME DIGNITY. BUT THE SETTINGS AREN'T DIGNIFIED. THE STREETS&&

COMPUTER: GO ON, KAREN.

KAREN: THE STREETS ARE UGLY, DISMAL. CONTRAST.

COMPUTER: SUPER, KAREN!
ANYTHING ELSE?

KAREN: YES.

COMPUTER: WHAT?

KAREN: I SEE SUFFERING AND COMMITMENT DESPITE IT BECAUSE HURSTWOOD HAS BOTH KINDS OF EXPERIENCE.

COMPUTER: THAT'S AN INTERESTING REASON.
ANYTHING ELSE?

KAREN: WHY DO YOU THINK THIS QUESTION IS ONE OF YOUR FAVORITES?

COMPUTER: WHY NOT, KAREN? REMEMBER WE'RE EXPLORING FOR ANSWERS.

KAREN: HOW DO YOU SEE HURSTWOOD'S SUFFERING. IS IT A PASSAGE?

COMPUTER: I CAN'T PRETEND TO KNOW HOW, BUT YOU'VE ASKED AN IMPORTANT QUESTION. REMEMBER IT.[1]

Understand that the computer never really understands what Karen is saying - it can't. She could type in her Social Security number and the program would reply "That's the idea, Karen. Give me some more information." Nevertheless the computer can ask her a series of leading questions - the questions we ourselves might ask a student who approaches us with the familiar "I don't know what to write about." It is true that the computer, being totally ignorant of English, may miss an opportunity to send a student in a specially fruitful direction, but it is also true that the computer can be

1. Hugh Burns, "A Writer's Tool: Computing as a Mode of Inventing," ED 193693, (1980), 8-9

leading ten, or twenty, or fifty Karens through the early stages of pre-writing while the course instructor can use his or her time to help students who are more nearly ready to begin writing their first draft.

Another nice aspect of Burns' prewriter is that it keeps a running record of the conversation between student and computer. Burns tells us that Karen continued with the questioning for forty minutes and left the computer center with eighteen pages of transcript which she could then use to help herself during the writing of the essay she was now prepared to write. This transcript could also be useful should Karen wish to discuss a point raised during questioning with her instructor.

Another of these new writing programs is one we created here at the University of Wisconsin - Marinette. It contains a prewriting questioner along the lines of Burns' but attempts to show subsequently how information gathered during questioning can be structured during the actual writing stage of composition. Here are several parts of an interaction made by one of our freshman composition students.

```
WELCOME TO ESSAY WRITER

THE PURPOSE OF THIS PROGRAM IS TO SHOW
YOU SOME OF THE INFORMATION NEEDED TO
WRITE AN ESSAY, AND TO SHOW YOU HOW
THAT INFORMATION CAN BE STRUCTURED.

THIS PROGRAM WILL ASK YOU A SERIES OF
QUESTIONS.  JUST ANSWER THEM AND THE
COMPUTER WILL DO THE REST.
```

FIRST, PICK A SUBJECT YOU WOULD LIKE TO
WRITE ABOUT. (JUST TYPE IN THE NAME
OF YOUR SUBJECT AND THEN HIT RETURN)

?TREES

THAT SOUNDS LIKE A GOOD TOPIC, BUT
MAYBE YOU COULD COME UP WITH AN EVEN
BETTER SUBJECT IF YOU GOT MORE
SPECIFIC. FOR EXAMPLE, IF YOU WERE
WRITING ABOUT A HOUSE, A MORE
INTERESTING SUBJECT MIGHT BE A
SPECIFIC ROOM LIKE A KITCHEN OR YOUR
ROOM. WHAT DO YOU THINK? I'M JUST A
COMPUTER AND SO DON'T KNOW. DO YOU
THINK YOU COULD MAKE YOUR SUBJECT MORE
SPECIFIC? WHY NOT REENTER YOUR
SUBJECT AND THEN HIT THE RETURN KEY
AGAIN?

?BIRCH TREES

GOOD. NOW LET'S TAKE A CLOSER LOOK AT
BIRCH TREES. TO BEGIN WITH, WHICH OF
THE FOLLOWING AREAS WOULD TELL ME THE
MOST ABOUT BIRCH TREES

1 ... HISTORY

2 ... APPEARANCE

3 ... CAUSES

4 ... JOB OR FUNCTION

TYPE IN THE NUMBER OF THE APPROACH THAT
WOULD TELL ME THE MOST ABOUT YOUR
SUBJECT, AND THEN HIT RETURN

?4

SO THE JOB OR FUNCTION OF BIRCH TREES
WILL TELL ME THE MOST. OKAY. LET'S
SEE

As can be seen, the primary initial effort is to force students to narrow their chosen subject and pick an approach to the subject. Having done this,

the program asks a series of questions asking students to list the major attributes (jobs or functions in this case) of the subject. As can be seen below, it then asks students to pick the most important attributes and explain them.

```
LET'S TRY A DESCRIPTIVE ESSAY.
TO BEGIN WITH INPUT THE NUMBER OF THE
THREE MOST IMPORTANT STATEMENTS BELOW.
(REMEMBER TO HIT RETURN AFTER EACH
NUMBER.)

1...THEY MAKE GOOD CANOES

2...THEY CAN BE MADE INTO FENCES

3...THEY MAKE GOOD FIREWOOD

4...THE BARK CAN BE STRIPPED TO MAKE A KIND OF PAPER.

5...NO

6...NO

?2
?3
?1
OKAY.  LET'S START WITH THE FIRST MAJOR
JOB OR FUNCTION OF BIRCH TREES.  YOU
SAID IT WAS THEY CAN BE MADE INTO
FENCES

I'M GOING TO GIVE YOU SPACE FOR SIX
DESCRIPTIVE SENTENCES.  I'D LIKE YOU
TO TYPE IN AS MANY SENTENCES AS YOU
CAN, DESCRIBING THIS JOB OR FUNCTION
OF BIRCH TREES

BE SURE TO HIT RETURN AT THE END OF
EACH SENTENCE.  IF YOU CAN'T THINK OF
SIX SENTENCES JUST HIT RETURN EACH
TIME I PRINT OUT A NUMBER.

1...?SINCE THEY ARE SO STRAIGHT BIRCH TREES CAN BE SET IN VERTICAL ROWS EASILY.
2...?BESIDES THEIR WHITE BARK MAKES THEM VERY ATTRACTIVE TO LOOK AT.
3...?SINCE THEY ARE A HARDWOOD THEY ALSO LAST LONGER THAN OTHER WOODS.
4...?
5...?
6...?
```

```
GOOD.  NOW TYPE IN THE NUMBER OF FULL
SENTENCES YOU JUST INPUT.

?3

NOW LET'S TRY THE NEXT MAJOR JOB OR
FUNCTION OF BIRCH TREES.  YOU SAID IT
WAS THEY MAKE GOOD FIREWOOD.
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Having requested this explanation for each important attribute, the program then creates a rough draft of an essay by making the major attributes paragraph topic sentences and the explanations the paragraphy body.

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                    BIRCH TREES

 IF YOU REALLY WANT TO UNDERSTAND BIRCH
TREES YOU HAVE TO BEGIN WITH BIRCH
TREES'S JOB OR FUNCTION.  THIS IS
BECAUSE THEY HAVE A GREAT ECONOMIC
IMPACT IN THIS AREA.

THE FIRST MAJOR JOB OR FUNCTION OF
BIRCH TREES IS THEY CAN BE MADE INTO
FENCES.  SINCE THEY ARE SO STRAIGHT
BIRCH TREES CAN BE SET IN VERTICAL
ROWS EASILY.  BESIDES THEIR WHITE BARK
MAKES THEM VERY ATTRACTIVE TO LOOK AT.
SINCE THEY ARE A HARDWOOD THEY ALSO
LAST LONGER THAN OTHER WOODS.

ANOTHER IMPORTANT JOB OR FUNCTION
OF BIRCH TREES IS THEY MAKE GOOD
FIREWOOD.  PIECES OF THEIR BARK CAN
BE LIT UP AS KINDLING.  THE LOG ITSELF
IS A HARDWOOD AND SO MAKES A GOOD HOT
FIRE.  YOU HAVE TO BE CAREFUL THAT
THE WOOD IS DRY THOUGH OR IT WILL
CAUSE A CHIMNEY FIRE.

THE LAST MAJOR JOB OR FUNCTION OF
BIRCH TREES IS THEY MAKE GOOD CANOES.
INDIANS MADE THE FIRST BIRCH BARK
CANOES.  THEY WERE VERY LIGHT TO CARRY
AND THE BARK WAS WATER PROOF.  IT WAS
ALSO SIMPLE TO STRIP THE BARK FOR
CANOES WITH BASIC TOOLS.  BY
STRETCHING THE BARK OVER A FRAME A
USEABLE CANOE COULD BE MADE IN 6
HOURS.
```

The program then supplies a lengthy explanation to the student of what it was doing at each stage of its questioning and why.

As is apparent from the initial questioning, the writer is set up to produce only the most rudimentary five paragraph essay. It's central effort is to force creation of topic sentences and then seek their substantiation. Sometimes it works; sometimes it doesn't. In any case it asks students some of the questions they should be asking themselves, gives them a record of their interaction with the computer, and shows them one way in which their ideas could be formulated. Obviously, however, this program is rudimentary. It is simply a first attempt and hopefully will be followed by more flexible and comprehensive programs.

One area of composition that has seen the benefit of numerous attempts is computer editing. Nearly twenty years ago Ellis Page of the University of Wisconsin[1] and James Hiller of the University of Rhode Island[2] independently created programs that could evaluate essays for such traits as sentence embedding and specificity of word choice. The technology of the time required that essays evaluated by the programs had to be transferred line by line onto punched cards, a mind-numbing task that would kill the enthusiasm of any researcher, but the programs did a reasonably accurate job of differentiating between well and poorly written essays.

1. Ellis Page, The Use of the Computer in Analyzing Student Essays, International Review of Education, 1968, 14, 210-24.

2. James Hiller, et. al., "Opinionation, Vagueness, and Specificity distinctions: Essay Traits measured by computer," American Educational Research Journal, 1969, 6, 271-86.

In recent years computer technology has improved and two new computer editors have been written. The first system was created at the University of Michigan in 1973 by Robert Bishop for use in journalism classes. His approach calls for students to be given the information they would need for a newsstory - who, when, where, how. Students then each sit down at a computer and type in what they think would be a good story on that event.

Bishop and his colleagues, meanwhile, have programmed the computer so it has a list of key words which they feel should be contained in this particular story. In an assigned article on the collision of two navy vessels, for example, the program was to search for the complete names of the ships involved, the time of the accident, and its location. If students left such information out, or didn't include it early in the story, the computer typed out an error message which read "Be sure to report near the beginning of the story when the accident occurred." If, on the other hand, students included the names in correct form and early in the story, the computer typed out, "Good. You have identified the destroyers by name, base and flotilla number early in the story. This is important to readers with relatives or friends who may have been in the accident."[1]

This kind of editor relies on a matching routine which takes a series of predetermined key words and searches for them in the student's newsstory. The program does not understand the story any more than other programs do, and so it will not respond to spelling errors, grammar errors, or gross inconsistencies in the story. Nevertheless the program does accomplish

1. Robert Bishop, "Adapting Computer-Assisted-Instruction to the Non-Programmer," ED081231, (1973), 3.

what Bishop intended - it helps impress upon beginning journalism students the need for certain kinds of information. When students supply required information they are immediately acknowledged for their success and reminded why their effort was important. Similarly, if they leave out pertinent data they are shown their error immediately and are given an explanation on the necessity of the missing data. This is no small accomplishment, and it frees the course instructor to take on the more challenging task of showing students such stylistic features as emphasis and organization.

Another successful computer editor currently in use was created by Professor Richard Lanham of U.C.L.A. His version of the approach has the computer "read" the essays students type into computer terminals, and then print out "statistics" on sentence length, use of prepositions, use of to-be verbs, and "shun" words (nouns). After each statistic is a one-line message warning about convoluted sentences if sentence length is too long, about passivity if there are too many to-be verbs, etc. The program also helps the student begin rewriting by locating all "shun" words, prepositions, and to-be verbs. Presumably a student can pick out a heavily laden sentence and begin rewriting there.

Lanham demonstrates his editor by showing how the program responded to a memo written by a nameless local administrator. The computer reprints the memo that has been typed into it, and then follows it with a series of "statistics" and comments.

In the face of both the severity and continuing character of the budgetary stringencies which we thus face, we have concluded that we must undertake an immediate and thorough programmatic review and re-ordering of academic priorities--a review that would have been required in any event, although, perhaps, on a less intensive time scale.

We are convinced that it is no longer possible to temporize and that action must soon be taken to assure that those elements of our program which are essential to the maintenance of a quality institution are protected and nurtured through consolidation, reduction, and elimination of those other elements which are found upon examination to be inessential or which can be rendered more economical or efficient through organizational or other changes.
This process, to be effective, must of course go beyond this Campus to the program of the University as a whole.
Indeed, it is increasingly clear that we must press for a prompt reassessment of the University's Growth Plan in the light of reduced fiscal expectations and seek an appropriate reordering of priorities.

Accordingly, discussions have been initiated with leaders of the Senate, and a procedure is being established for the prompt development and coordinated review of proposals for such changes.

STATISTICS

Number of words: 206.0
Number of sentences: 5.0
Average number of words per sentence: 41.20
WATCH OUT! You may have created overly convoluted sentences!

Number of prepositions: 31
Average prepositions per sentence: 6.20
Word to preposition ratio: 6.65
I am not amused -- too many PREPOSITIONS and/or INFINITIVES!

Number of to-be verbs: 14
Average to-be verbs per sentence: 2.80
Word to-be verb ratio: 14.71
OH, MY! All those "TO-BE" verbs distress me!

Number of "shun" words: 9
Average "shun" words per sentence: 1.80
Word to "shun" word ratio: 22.89
Dull "SHUN" words often can become lively verbs -- try it.[1]

As in the case of Robert Bishop's editor, this editor is incomplete in that it responds only to a few traits that can quickly be tallied by a computer using a word counter and a key word matching routine. As in Bishop's case the editor would miss grammar or spelling errors and could make no comment at all about whether an essay is treating a subject in a complete, original, or persuasive manner. Even Alexander Haig would be given high marks as long as he kept his sentences short and avoided passives. But as can be seen in the example above, useful information is supplied to students. Having received this response to their first draft, students could then go to their instructor for help in eliminating the shortcomings found by the computer.

So what are we to make of all these new computer programs? To begin with, we have to look on them with charity. They are all in their infancy, and while each of them is still being upgraded, they are all many years from maturity. Second, what stands out about these programs is their small number. Computers have been accessible to college instructors for twenty years, yet we in English have seldom even glanced in their direction. Better programs will be produced when more minds attack the problem. Lastly, despite their novelty and small numbers, and despite the complexity of the problem they address, these programs work. They are all used on a daily basis by students, and while they are all flawed and limited, they each serve a function - they each do part of the job of instructing students in writing. This is no small feat.

1. Richard Lanham, Correspondence, July, 1981.